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# PATENT SPECIFICATION

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## DRAWINGS ATTACHED



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### (54) COLLAPSIBLE CRATE OR BOX

(71) We, HOLZWERTE AG, a Swiss company of Dufourstrasse 119, Zurich, Switzerland, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to collapsible crates or boxes.

According to the present invention there is provided a collapsible crate or box including a bottom panel, side wall panels and connecting strips for connecting the side wall panels to one another and to the bottom panel, all said panels having grooves in one face thereof extending parallel to and in close proximity to all the respective edges of said panels, said connecting strips each including two channels defined by parallel legs, said channels being disposed substantially at an angle of 90° with respect to one another and said legs being so shaped that the channels are narrowed at their mouths and at least those connecting strips that connect the side wall panels to the bottom panel constituting hinge-forming strips which include a flexible web extending between and interconnecting the two channels, the legs of said hinge-forming strips being resilient, said flexible web including a narrow active bending location portion having a thickness less than one-half the thickness of the adjacent web portions, the active bending location portion being located on one side of said web and comprising a cut-out portion having concave and convex sides, the opposite side of said web being planar, said location thus being disposed off-centre with respect to said adjacent web portions.

Thus a collapsible or knock-down crate or box according to the present invention, when empty, occupies very little space, does not need to be disassembled completely and is readily reassembled with a minimum of effort and in a minimum of time.

Said flexible web may be of the same material as the associated channels. Alternatively, said flexible web may be of a different material than the associated channels.

Said opposite side of said web may be disposed substantially parallel to adjacent side portions of said channels in the collapsed condition of the crate or box.

Said flexible web may comprise a woven textile web having opposite ends anchored in the respective channels. Alternatively said flexible web may comprise a synthetic plastics web.

The invention is illustrated, merely by way of example, in the accompanying drawings, in which:—

Figure 1 is an exploded perspective view illustrating the components of a collapsible crate or box of the present invention in partly disassembled condition,

Figure 2 is a perspective view illustrating a bottom panel and two opposite side wall panels connected thereto and with one side wall panel in outwardly folded condition,

Figure 3 is a fragmentary perspective view illustrating a connecting strip and adjacent frames in their related positions just prior to assembly,

Figure 4 is a fragmentary perspective view illustrating a hinge-forming strip,

Figure 5 is a fragmentary perspective view illustrating the hinge-forming strip of Figure 4 assembled with adjacent panels,

Figure 6 is a fragmentary perspective view illustrating the groove arrangement at the corner of a panel.

Figure 7 is a cross-section on an enlarged scale illustrating an embodiment in which a flexible web is a material different than that of the hinge-forming strip, and

Figure 8 is a similar view to Figure 7 illustrating another embodiment in which a flexible web is integral with the hinge forming strip.

A collapsible or knock-down crate or box illustrated in Figure 1 includes panels constituting a bottom 1, a lid or closure 2 and side walls panels 3, 4, 5, 6. All of the side walls panels are provided on one face with grooves 7 and 8 of rectangular cross-section and of uniform depth that extend parallel to and in close proximity to all the edges of the side wall panels.

The bottom 1, lid 2 and side wall panels 3, 4, 5, 6 may be constructed of wood, commercially available fibre or chip board, tempered fibreboard and in fact of any commercially available material capable of being cut to size and grooved as required and of sufficient strength for the purpose intended.

Connecting strips 9 and 11, are preferably made of synthetic plastic material, shaped to connect adjacent side wall panels 3, 4, 5, 6 to one another. All four side wall panels 3, 4, 5, 6 are connected to the bottom by hinge-forming strips 12, 13 (shown in greater detail in Figures 7 and 8).

Figure 2 illustrates the bottom 1 with side wall panels 3 and 4 attached thereto. The connecting strips 11 have been removed and the side wall panel 4 has been folded outwardly to lie in approximately the same plane as the plane containing the bottom 1. When hinge-forming strips 12, 13 are utilized, the portion of the box or crate comprising the bottom 1 and side panels 3 and 4 can be transported or shipped in space-saving fashion with these three panel components connected together, in that with the side wall panels 3, 4 folded outwardly, the other individual component parts that constitute the crate or box can be stacked on top of one another and on top of the bottom 1. Thus the side wall panels 5 and 6 and the lid 2 can be placed flat on the bottom 1 and the connecting strips 9, 11 stacked thereon. Alternatively, if hinge-forming strips 12, 13 are utilized to connect side panels 5 and 6 to the bottom 1, the box assembly can be shipped with all four side panels folded outwardly to lie in flat condition and connected with the bottom 1.

Figure 3 illustrates the cross-sectional shape of connecting strips 9 and 11 and their disposition relative to two adjacent side wall panels prior to assembly. Each of these connecting strips 9, 11 is provided with two deep, profiled channels or troughs 14, 15 defined by parallel legs, the channels extending perpendicularly to one another. These troughs 14, 15 include outer resilient legs 16, 17 respectively having shaped noses or end portions 18, 19 respectively of triangular cross section. An extension of the leg 16 of trough 14 defines the end of the trough 15 and the two legs of trough 14 are connected by a web or bridge 17a which also constitutes part of the trough 15.

Each of the side panels, the ends 20, 21 of which are shown in Figure 3, include respective grooves 22, 23 whose distance from the edges of the panels correspond to the distance between the shaped noses 18, 19 and the base of each trough 14, 15. The panels can be removably connected to the connecting strips either by inserting the panels into the channels or troughs in the direction shown by the arrows or by sliding

the panels into the respective channels or troughs in a direction parallel to the longitudinal axes of grooves 22, 23. When inserting the panels into the channels in the direction of the arrows shown in Figure 3, the resiliency of the legs 16, 17 of the channel allows the same to deflect outwardly until the noses 18, 19 snap into the grooves 22, 23 respectively.

Figure 4 illustrates a hinge-forming strip 13 prior to assembling the same with the bottom and a side wall panel. This hinge-forming strip is also constructed of synthetic plastics material. The hinge-forming strip 13 includes two identical hinge-leaf portions 24, 25, each of profiled channel-shaped cross section, and including equi-length legs 29, 30 and 27, 28 respectively that are parallel to one another and which define grooves or channels 15<sup>1</sup> and 14<sup>1</sup> which enclose or surround the edges of the panels. Shaped noses 31, 32 snap into the grooves formed in the panels when the latter are inserted due to the resilience of the legs 29, 30 and 27, 28. A thin flexible bridge or web 26 connects the hinge-leaf portions 24, 25 together. This web 26 can be a woven fabric web embedded in the material of which the hinge-leaf portions 24, 25 are made, or it can be a strip of synthetic plastic material of great flexibility, likewise having its ends embedded in the hinge-leaf portions 24, 25.

Figure 5 illustrates the hinge-forming strip with panels 33 and 34 inserted therein, in the positions occupied by the bottom and one side panel, if the box were in use. As shown, the web 26 permits folding of the hinge-leaf portions 24, 25 relative to one another.

Figure 6 illustrates a corner of a side wall panel with two grooves 35 and 36 formed therein. Each of these grooves extends the full length of a side of a panel and as illustrated in connection with side wall panel 5 in Figure 1, the grooves extend all around the panel on one face thereof, parallel to the edges and at the same distance from the edges.

Generally, the connecting strips and hinge-forming strips are mitred at their corners as shown in Figure 1, so that they meet at the corners. However, it is also feasible to construct the connecting strips and hinge-forming strips with straight ends and so relate their respective lengths as to permit proper assembly and disassembly of the crate or box.

Figures 7 and 8 illustrate a particular shape of a web 26 which has a long life. Surprisingly, it has been ascertained that a particularly advantageous shape of the web 26 can be obtained by providing a short, asymmetrically arranged active bending point or location. The side of the active bending point or location which, when being folded or bent, is subjected to tensile stress, has

radii of approximately the same magnitude, whereas the side of the web subjected to compressive stress merges with the web without change. By providing the active bending point or location in the web with this particular shape, it is possible to construct the web and its shaped bending location of the same material as that of the hinge-leaf portions, thus simplifying production of the hinge-forming strips.

The relatively narrow active bending point or location is indicated at 40 in Figures 7 and 8. This location is not in the centre of the web thickness of the adjacent web portions 41, 42 and 43, 44 respectively, but is located off-centre relative to the web portions. On the side where tensile stress is developed during a folding operation, the web has a cut-out of radii R, the cut-out having concave and convex side portions. The side of the web exposed to compressive stress, has a planar surface when it is in rest or static condition. This surface is parallel to one side of the adjacent hinge-leaf portions 24, 25 in Figure 7, whereas in Figure 8, this side of the web merges with the adjacent sides of the hinge-leaf portions 54, 55. As indicated in Figures 7 and 8, the thickness of the active bending point or location of the web is less than one-half the thickness of the adjacent web portions 41, 42 and 43, 44, respectively.

In assembling the component parts of the crate or box from the position of the parts shown in Figure 1, the initial step would be inserting side wall panels 5, 6 from above and sliding them downwardly into the troughs 14, 15 of the vertically disposed connecting strips 9 and 11. Then the lid 2 is placed in position so that its connecting components cooperate with the upper edges of all of the side panels and the lid is tapped downwardly until its connection components lock in the grooves at the upper edges of the side wall panels. The lid assembly can have a depending rim portion having a channel shaped configuration (not shown), the outer legs of the channels being resilient and having noses shaped to snap in place in the grooves that extend horizontally of the upper edges of the respective side wall panels. Further, as an alternative, connecting strips as separate components and constructed as in Figure 3 can be applied over the four edges of a top panel that is also grooved in the same manner as the side wall panels and then those connecting strip means can be inserted or placed over the upper edges of the assembled side panels to secure the lid to the crate or box.

If a lid is provided, it is desirable to have the lid function as a hinged closure, a hinge-forming strip can be associated between one side wall panel such as 5 and a lid constructed similar to bottom 1. Also hinge-

forming connecting strips could be used on all four edges of a lid.

Further, the connecting strips that connect side wall panels 5 and 6 to the bottom 1, can be either hinge forming strips as in Figures 5, 7 and 8 or connecting strips similar to Figure 3, such as element 10 of Figure 1.

To remove the lid, a screw driver or other flat bladed tool can be inserted between the exterior of the side wall panels and the outer leg of the connecting strip that is in the grooves of the respective side wall panels, and by deflecting the outer leg of this connecting strip, the shaped nose such as 19, due to its resiliency characteristics, can be deflected out of its associated grooves so that the connecting strip can be moved upwardly in removing the lid.

#### WHAT WE CLAIM IS:—

1. A collapsible crate or box including a bottom panel, side wall panels and connecting strips for connecting the side wall panels to one another and to the bottom panel, all said panels having grooves in one face thereof extending parallel to and in close proximity to all the respective edges of said panels, said connecting strips each including two channels defined by parallel legs, said channels being disposed substantially at an angle of 90° with respect to one another and said legs being so shaped that the channels are narrowed at their mouths and at least those connecting strips that connect the side wall panels to the bottom panel constituting hinge-forming strips which include a flexible web extending between and interconnecting the two channels, the legs of said hinge-forming strips being resilient, said flexible web including a narrow active bending location portion having a thickness less than one-half the thickness of the adjacent web portions, the active bending location portion being located on one side of said web and comprising a cut-out portion having concave and convex sides, the opposite side of said web being planar, said location thus being disposed off-centre with respect to said adjacent web portions.

2. A collapsible crate or box as claimed in claim 1 in which said flexible web is of the same material as the associated channels.

3. A collapsible crate or box as claimed in claim 1, in which said flexible web is of a different material than the associated channels.

4. A collapsible crate or box as claimed in any preceding claim wherein said opposite side of said web is disposed substantially parallel to adjacent side portions of said channels in the collapsed condition of the crate or box.

5. A collapsible crate or box as claimed in claim 1 in which said flexible web com-

prises a woven textile web having opposite ends anchored in the respective channels. and as shown in the accompanying drawings.

6. A collapsible crate or box as claimed in claim 1 in which said flexible web comprises a synthetic plastic web.
- 5

7. A collapsible crate or box substantially as herein described with reference to

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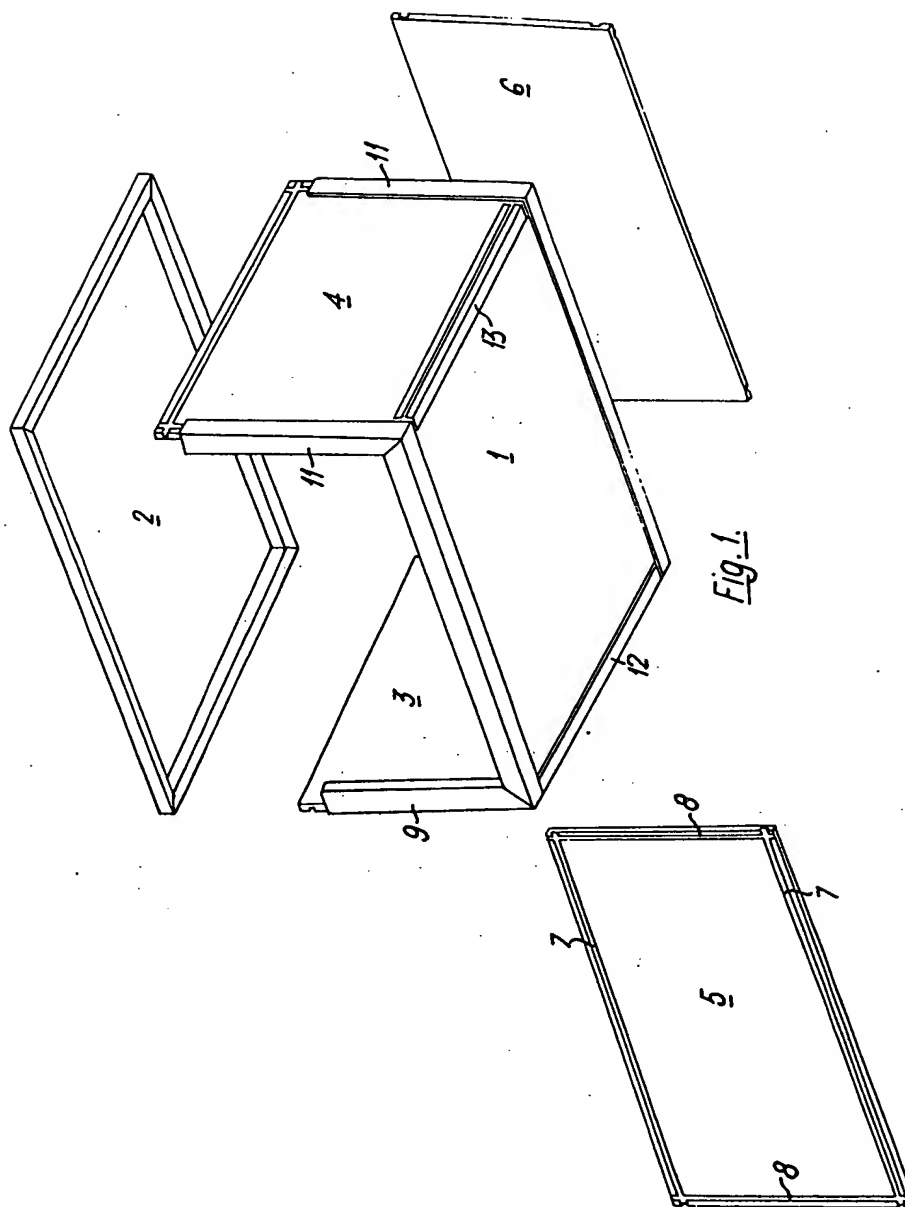
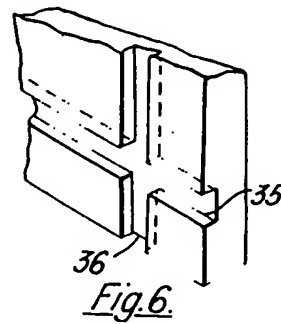
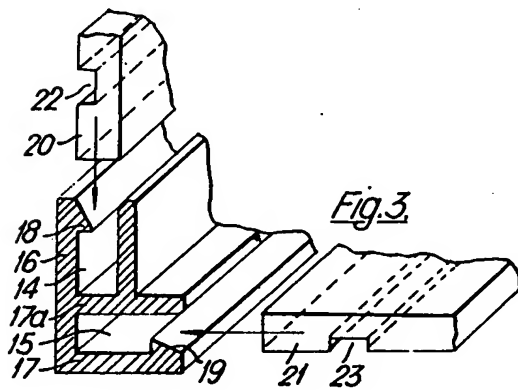
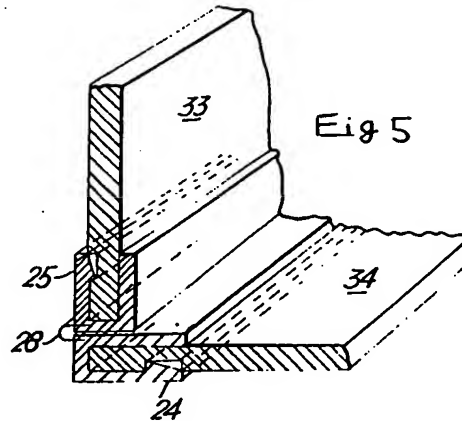
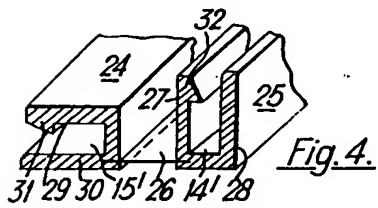
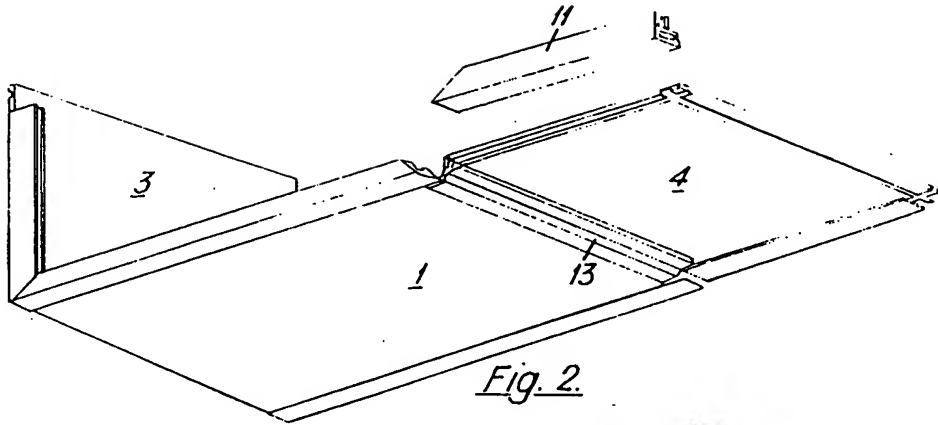
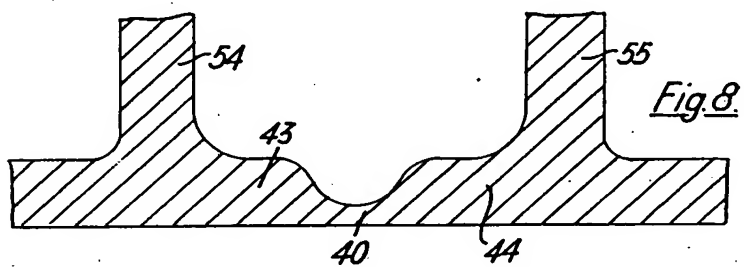
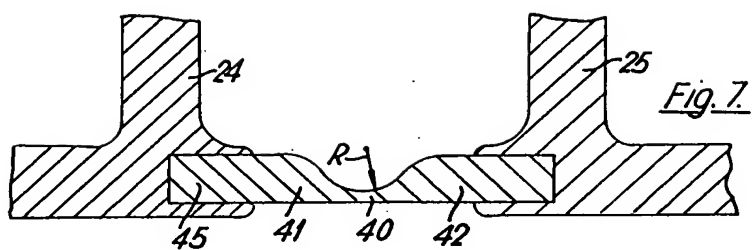


Fig. 1.

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